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ABSTRACT

The Brigham Young University Harold B. Lee Library installed a theft-detection system, the "Tattle Tape" system marketed by 3M Corporation, to counteract the theft of items from its collection. This research report describes a study that statistically estimated the loss rate for the entire collection and for various broad classes within the collection as well. Methodology is described, and an analysis of data, supported with tabulated data, is presented. Findings suggest that, while the estimated loss rate for the entire collection, 4.94 percent, does not seem alarmingly excessive, estimated loss rates in three broad classes, the 100's (13.28 percent), 400's (22.22 percent), and 500's (12.91 percent), indicate an urgent need for further study. (Author/JD)

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APPLICATION OF A COLLECTION LOSS RATE DETERMINATION HEURISTIC TO THE BRIGHAM YOUNG UNIVERSITY HAROLD B. LEE LIBRARY COLLECTION

by

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A Research Paper

Submitted to The

School of Library and Information Sciences

Brigham Young University

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ABSTRACT

The Brigham Young University Harold B. Lee Library, in common with most other libraries, has encountered difficulties with the theft of items from its collection. To counteract this difficulty, a theft-detection system, the "Tattle Tape" system marketed by 3M Corp., was installed in the Lee Library. To date, no study has been conducted to determine the loss rate for the Lee Library collection.

The collection was randomly sampled. The sample items were either physically located in the stacks or in the Reserve Library or were located by means of circulation records. Those sample items not located in any of these three areas were presumed stolen or lost.

This study enabled the writer to statistically estimate the loss rate for the entire collection of the Lee Library. Study results also enabled the writer to propose estimated loss rates for the various broad classes within the collection. While the estimated loss rate for the entire collection, 4.94%, does not seem alarmingly excessive, estimated loss rates in three broad classes, the 100's, 400's and 500's of 13.28%, 22.22% and 12.91% respectively, indicate the urgent need for closer study in those areas.

ACKNOWLEDGEMENTS

I should like to eloquently express my gratitude to Keith Stirling for the many helpful suggestions that he offered and for helping me to adapt two computer programs for use in this study. I should equally like to express the extent of my appreciation to my good wife, Victoria, for her encouragement and for bearing the brunt of our family obligations to permit me to conduct this study. However, I fear that eloquence has failed me once again and that I will simply have to say "thank you."

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Chapter 1

THE PROBLEM

Statement of the Problem

What is the rate of loss of materials from the Lee Library collection?

Inclusions

This study determined a statistically estimated rate of loss for the collection of the Lee Library. It also permitted inferences about the loss rates in the broad classes within the collection, thus pinpointing areas which require further study.

Exclusions

The study did not attempt to ascertain an absolute loss rate for the Lee Library. That could only be done by verification of the status of the entire collection population of 1,000,000+ volumes. While loss rates in the broad classes were inferentially determined, these rates must be highly suspect and used only as gross indicators of trends, not as representative of reality.

Hypotheses

The first hypothesis to be included in the study was that the application of statistical sampling methods make it

possible to determine a usable loss estimate of the rate of loss for the Lee Library collection. The data accumulated during the study facilitated estimates of the loss rate in the broad classes.

The second hypothesis inherent in the study was that the broad classes of the collection should be represented in the sample in proportion to their relationship to the entire collection.

These hypotheses appeared to be supported by the study.

Definitions

Loss rate: the percentage of items of a given class that are no longer in possession of the Lee Library due to loss or theft.

Broad class: the ten broad classes enumerated in the Dewey Decimal Classification Scheme.

Sample: a representation of an entire set chosen at random.

Sample item: item selected as cognate with a random number used in the sample of the study. May be either a book or bound periodical.

Assumptions

For purposes of this study, it is assumed that if an item is not located in the stacks, in the Reserve Library, nor in circulation records as currently checked out, that item is lost.

While it is evident that items could be found in other areas of the library in which they do not belong, misplaced deliberately or carelessly, it is not possible to

determine what items belong in this category. "Squirreling" of books in particular areas to avoid checking them out or simply removing them from the stacks and leaving them in some other area is likely to remain fairly constant over time and should not affect the study results appreciably. If an item is not available to a user for either of these or for similar reasons, the item is still "lost" for all intents and purposes.

Chapter 2

LITERATURE SEARCH

No previous studies regarding the evaluation of the Lee Library collection loss rate exist.

While numerous books and periodical articles are available which deal with loss rate determination, the specificity of this study precluded their being of any particular use, necessitating the origination of the loss determination heuristic described in Chapter 3.

Chapter 3

METHODOLOGY

The shelf list was used as best representing the collection because, while it represents all of the titles in the collection, it is limited to one entry per title.

It was determined at the beginning of the study on March 27, 1977, that the shelf list is stored in 1110 drawers. This is the number of drawers that actually contain cards. Other drawers are also present. They are empty and are to be used for expansion at a later date.

It was determined that a level of significance of .05 with a confidence interval of .95 would be desirable for this study. Accordingly, a random sample of 300 of the 1110 drawers that comprise the shelf list was drawn using the B.Y.U. DEC-10 computer and a program designed for that purpose.

Next, actual shelf list drawers were identified which corresponded to the computer-generated random number list. As shelf list drawers are not identified by number, it was necessary to count through the drawers, which are identified by labels which state the call number range contained within them, and match the random number to a particular drawer subsequently identified by shelf list range label.

Next, it was necessary to determine the number of

cards contained within each drawer. This was done by means of measurement using a ruler calibrated to 50ths of an inch. Each drawer was so measured. Following this measurement, all of the resulting numbers were converted to 100ths of an inch. The commonly used standard for library catalog card measurement is 100 cards per inch. Thus, the figures, expressed in 100ths of an inch represented the actual count of cards in each drawer.

Following the measurement of cards, the total number of cards in all of the 300 drawers was computed and a random sample of 384 items was drawn from the 300 drawers. This was accomplished by inputing all of the drawer measurements, expressed in 100ths of an inch, into a computer file and processing these data by means of the DEC-10 computer and a program designed to sum the number of cards as though they were in one large drawer. Although it does this, the program also keeps track of the number of cards in each of the 300 sample drawers, remembering where one drawer begins and another ends in the combined "drawer."

After the cards have been thus combined, the program instructed the computer to generate a sample of 384 items from all of the cards. This number of items is the number which is necessary to insure the desired level of significance and confidence interval drawing from a population of 500,000 or more which was somewhat more than required for our population size of approximately 200,000 cards. When the sample items were selected, the program then instructed the

computer to disassemble the imaginary "drawer" into its 300 component drawers. When doing so, the computer was also instructed to keep track of which of the sample items was located in which drawer. The computer was also instructed to determine which card in each of the 300 drawers was the random sample card previously selected.

Finally, the computer was programmed to designate the drawer and card number within those drawers of each of the 384 sample items. This resulted in a printout which contained this information.

It was next necessary to return to the designated drawers and to locate the designated cards representing the 384 sample items. The numerical location of each card had been reconverted to 50ths of an inch. The cards were located by means of a ruler calibrated to 50ths of an inch. The cards within the drawer were compressed and the sample cards were located by finding the card which corresponded in position to the numeric equivalent of the computer-generated random sample numbers.

As each card was located, the call number and author surname or the first word of the name of a corporate author was noted. Each of the 384 sample items was thus identified.

The final phase of data-gathering consisted of verification that each sample item either was or was not under the control of the library. In order to determine this, each item was first searched for in the stacks. Those items so located were noted. Those items not so located were

searched for in the Reserve Library. Again, those items so located were noted and those items not so located were searched for in the records of materials currently checked out in the circulation section of the library. Those items so found were noted, leaving a list of items which were missing.

The number of missing items was divided by the sample number of 384, producing the figure which represents the percentage of loss for the entire collection. The number of missing items in each broad class was divided by the number of items of that class which were contained within the collection sample. These computations produced the percentages of loss for each of the broad classes shown in Table 2.

Chapter 4

ANALYSIS OF DATA

The broad class distribution expressed as both numbers of items and percentage of the entire collection comprised by that class are shown in Table 1 below.

Table 1

Population Distribution by Broad Class

Class	# Items In Sample	Class % Of Sample
000	16	4.16
100	7	1.82
200	45	11.71
300	77	20.05
400	9	2.34
500	24	6.25
600	32	8.33
700	12	3.12
800	74	19.27
900	88	23.17
	Total 384	Total 100.22

The initial search of the stacks resulted in the location of 357 items, representing 92.97% of the sample. The search of the Reserve Library turned up one additional

item, which, combined with the previously located items, accounted for 93.23% of the sample items. The search of current circulation records located 7 additional items, which accounted for 95.06% of the sample population. Thus, 19 items, or 4.94% of the sample was not found, indicating that 4.94% is the statistically computed loss rate for the Lee Library collection.

The estimated loss percentages for each broad class were computed by dividing the number of lost items in each broad class by the total number of items in that class which appeared in the sample population. The estimated loss rate percentages by broad class so derived are shown in Table 2.

Table 2

Estimated Loss Percentages

By Broad Class

Class	# Items In Sample	# Items Lost	Estimated Percentage
000	16	0	0
100	7	1	13.28
200	45	1	2.22
300	77	2	2.59
400	9	2	22.22
500	24	3	12.91
600	32	2	6.25
700	12	0	0
800	74	3	4.05
900	88	5	5.68

Chapter 5

SUMMARY AND CONCLUSIONS

This study has established that the approximate loss rate for the Lee Library collection was 4.94% on April 6, 1977.

In 4 broad classes, the computed loss rates exceeded 5%, possibly pinpointing areas where the loss rate is abnormally high.

As this is the first study which attempted to establish loss rates, no statements can be made at this time regarding the effectiveness of the 3M Corp. "Tattle Tape" system in the Lee Library.

Several recommendations for additional research appear warranted.

First, it is recommended that similar heuristic loss rate studies, as opposed to total population studies, be conducted in the four broad classes, the 100's, 400's, 500's and 600's due to the indicated high loss rate experienced in those classes.

Secondly, it is recommended that similar studies be conducted in the future, thus isolating areas with abnormally high loss rates for further analysis and corrective action. Such follow-up studies should provide criteria by which the effectiveness of the 3M "Tattle Tape" system may be evaluated by management.